AMERICAN ELECTRO-PLATERS SOCIETY

(An Educational Society)

Chartered 1909

MONTHLY REVIEW

JUNE, 1916

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Vol. 3 JUNE No. 6

EDITORIALS

THINK.

By CHARLES H. PROCTOR.

A recent paper presented at the Spring Meeting of the American Electrochemical Society at Washington, D. C., was devoted to "Some Unsolved Problems of the Electro-Plater." This paper was presented by our esteemed Past President, George B. Hogaboom, and created unusual interest because it contained many of the unsolved problems yet to be solved.

During my many years' connection with the plating industry and the thousands of questions I have answered it occurs to me that one of the greatest of the unsolved problems a plater has to contend with is the lack of clear conscientious thought. If he would *think* more, and let that one idea of consistent thought permeate his mind, many of the problems that arise would be solved. It is consistent thought that has made the world today what it is, but there was a time in the history of the human race when a man could not be absolute master of his thoughts. When it was dangerous to express thoughts that conflicted with religion and when it was dangerous to express thoughts that conflicted with religion it was dangerous to utter words that science had commenced to teach the human mind of the true laws of cause and effect and their relation to each other.

But evolution of human thought has changed all these things when the darkness was dispelled and we understood the true relation of one thing to another, then the human race, through thought, commenced to evolve. The brain was taught to think and all the modern wonders of the world originated because man thought out these wonders by persistent application of thought.

In perusing the MONTHLY REVIEW, many times I have noted the lack of persistent thought, not that I for one moment wish to criticise or act as a critic upon anything that is written in its pages; but many of the problems that our members have to contend with would be easily solved by the persistent application of thought.

In writing this short editorial I have but one thought in mind, and that is to *think* deeper and be more consistent, and many problems that develop each day can be solved by persistent thought. We must not think lightly but deeply; study the true relation of cause and effect, for there is a reason for all things. If we obtain results today from a solution under certain conditions, and we term those

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In writing this short editorial I have but one thought in mind, and that is to *think* deeper and be more consistent, and many problems that develop each day can be solved by persistent thought. We must not think lightly but deeply; study the true relation of cause and effect, for there is a reason for all things. If we obtain results today from a solution under certain conditions, and we term those

results successful results, then tomorrow and the next day and so on we must obtain the same results under the same conditions; but if these conditions change, then the results will change also.

It is with gratification that I note that so many of our members have taken up the study of chemistry in connection with the various branches. They are thinking and from the knowledge they obtain through scientific thought the unsolved problems will be solved, and many small problems that cause the plater many weary hours will become only as flitting shadows in the scientific light of the sunshine of knowledge that will make his pathway clearer through the persistent application of the one word—*think*.

GETTING READY.

I knew a salesman who was always getting ready to sell goods. Before he got ready, he lost his job.

I knew a man who was always planning to do something wonderful. He intended to write a book. He never started the book. He died in obscurity, of old age. In his last moments he talked about the book that he had intended to write.

I knew a man who was always gathering information. All of his life he worked hard gathering information. He never started to use this information, and he died leaving a great library and a wonderful collection of notes.

TOO BUSY TO READ.

He is a familiar type—the fussy, fretful man who imagines that he is about the busiest fellow in town.

He often dumps in the wastebasket unwrapped copies of business or technical magazines that contain valuable articles bearing directly on his problems. He fondly believes that he is too busy practicing to bother with what others are "preaching."

The trouble with this type of man is that he has not learned that the real executive is the man who so plans his work as to leave a reasonable amount of time for reading and planning.

There are shoals and breakers ahead when the accumulation of new ideas ceases. The man who declares he has no time to read is unconsciously advertising his small calibre, his slavery to detail, his arrested development.—Elliot "Impressions."

Take your cup of sorrow out to the laboratory and you will be surprised at the amount of happiness an analysis will show.

The most plausible man I ever met was one with the worst reputation.

Nothing worth having can be obtained without the cost of effort.

Nothing exceeds like excess.

LETTER FROM GEORGE HOGABOOM.

New Britain, Conn.

Dear Mr. Richards,

St. Louis, Mo.

Your letter was most interesting and I regret that the samples of nickel-plating did not arrive until the day after I left for Washington.

The meeting was very good and the discussions of nickel-plating brought out very many good points. I only wish that a systematic study could be made of nickel solution. I think that probably the Bureau of Standards will do something when their new building is completed, but that will be at least another year. They have done some wonderful work with electrotyping baths. I had a talk with the director, Dr. S. W. Stratton, and Dr. Blum, and they are anxious to take up electro-plating.

I see the next convention is to be held in Cleveland. I think that is better than Toronto at the present time, although it would have been nice to visit them and see their laboratory.

Don't you think that if each Branch was to take up the discussion of one solution, say, nickel, have one or more members prepare a paper, to be followed by a general discussion which should be taken down stenographically and transcribed, that such a plan would furnish excellent material for the REVIEW? If each Branch would do that it would make excellent reading. I am sure that some member has a "shorthand" friend who, for a small consideration which could be defrayed by a collection at the meeting, would report the meeting's proceedings.

Individuals run dry of material or shun the continual work of writing for publication and therefore you run short of material. I find it difficult to get into the harness again, and deeply feel it, as it was one of my greatest pleasures.

I think the Society has made a wonderful showing to hold its own during the past year and the prospects never seemed brighter. I do believe, however, that more real work could be done if we would only be more generous with our experiences; but that is sure to come. More of that at Cleveland, where I hope to see you. Lake Erie for you this year. Yours truly,

GEORGE B. HOGABOOM.

[Mr. Hogaboom's contributions to the REVIEW will never be forgotten, even if we never hear from him again. We believe, however, that George Hogaboom's sun of electro-plating knowledge is still shining as brightly as ever and, though possibly sometimes obscured by the clouds of overwork and lack of time, will shine again with all its old-time brilliance and once more penetrate the dark corners of ignorance and guide the plater's steps in the paths of knowledge and success.—EDITOR.]

Did it ever occur to you that you are entitled to a certain share of your own life —take it.

POINTERS FOR PLATERS.

By W. S. Elwin, Bristol, Conn., Bridgeport, Cranch.

My conscience has bothered me long enough and now, after reading the pleas of our hard-working editor to contribute something to our monthly. I have kicked myself, pinched myself and woke up. Why in the world am I a member if I don't contribute something to my fellow-members of our great A. E. S.?

I am a bum scribe, that I admit, but I am going to make the plunge, and if any of you members, who haven't contributed once, ask yourself, "Who is that guy?" I'll answer for you by asking, "Who are you? I never heard of you or from you, so write something and let's get acquainted."

If this article will make someone else take the plunge and write something, my only wish is that enough will feel encouraged and so many articles will come via United States mail route to our editors they will have to make a bi-monthly instead of a monthly.

Well, here goes. Some time ago I was in deep trouble over the fact I could not strip nickel off of zinc when any imperfection showed up in the finish. Result: Scrap-pile increased.

I fought first to overcome the cause of imperfections and hold them at the minimum. Still I was not satisfied even with a scrap heap of only 2 per cent (N. P. on zinc) and desired to save all the spoiled work by refinishing. I tried everything I could think of, until one day Mr. Charles Proctor, when being questioned about it, asked me if I had tried sulphuric acid and table salt; that gave me an idea. Since then I have been stripping all metals and leaving the surface so smooth a small coloring buff wheel on brass, copper and zinc work or 180 and oil polishing wheel on steel and cast iron was all that was necessary to bring the article back to the state of perfection ready for plating. I have since then saved every piece of work spoiled by plating or marred or scratched after finishing.

In cases where work was to be refinished after years of use, I found it a very economical method in stripping the old deposits. All there is to it is to use sulphuric acid and water and reverse the current, using lead anodes.

In the case of N. P. brass and copper, use a solution, 5 acid, 1 water. In the case of zinc N. P., use acid 7, water 1 part and 7 and 1 in case of iron or steel. I have stripped steel knives this way and merely plated them over without putting on a polishing wheel.

Many of you have heard of this before, but I have never seen it in our monthly, or in any technical paper except once, and that paper had sodium chloride and water in excess added to the acid, and results were not satisfactory. Use 6 volts and the articles will be stripped in less than a minute with a surface smooth, but not bright; and the credit, if there is any, should go to Mr. Proctor.

I merely worked out the problem after he tipped me off, but I have saved a lot of work, especially since nickel-plated work and the scrap from the plating department is nil.

I have been doing this for three years and with great success.

Another thing I have found is an oil-base lacquer on the market which, to my mind, is a boon to manufacturers on account of the present high price of annyl lacquers.

I know our paper is not an advertising medium and so will not state who manufactures this lacquer for that reason, but I have experimented with this lacquer and I can put a firm cohesive coat and cover three times the surface per gallon at the cost of $1.50 per gallon. And, best yet, no finger marks will appear after handling. I merely mention this because I am enthusiastic over results I have had.

Another idea I have had working for years is to take steel wire and cut it up in pieces about ⅛ inch long and, after hardening, roll bright; then use them instead of using steel balls for burnishing at 28 cents per pound. Try it.

Well, Mr. Editor, I have taken a plunge and I feel like a fellow after a cold bath. If I haven't written anything interesting, I'll try again, because I won't stay down from now on, and practice makes perfect, and I'll "stick to it," for

Daniel in the lions' den
Stuck to it.
So have many famous men
Stuck to it.

Robert Fulton, years ago,
Said he'd make his steamboat go,
And stuck to it.
Robert's friends began to jolly;
Called the steamboat "Fulton's Folly";
But the durned thing went, by golly!
He stuck to it.

If you've got a thing that's good,
Stick to it.
If you've said the thing you should,
Stick to it.

Caesar crossed the Rubicon;
Pompey dared him to come on;
Caesar took the dare and won—
Sticking to it.

TO CONTRIBUTORS.

In this, the last number of our fiscal year, I wish to thank the members and friends who have written for the pages of the Review. You have helped advance the art of electro plating. You have cast the bread of your knowledge upon the waters, may it return to you a hundred fold. —Ed.

I have received a request from Ed. Heil to duck H. H. Williams in Lake Erie, even if it causes a tidal wave.—Ed.

INTERESTING QUESTIONS CONCERNING BRASS PLATING.

By Frank Duffy, New York Branch.

I thought I would write you about an idea that came to my mind, on looking over the different rates of deposits of metals, especially copper and zinc, which are used in brass plating. In the electro deposition of brass, one of the most troublesome things the plater has to contend with is the excess of zinc which is found in the solution. This zinc is either caused by the addition of the metallic salt by the use of additional agents or, in my opinion, by the current. Mr. Hogaboom states that when the zinc content in a brass solution reaches a certain point it precipitates itself from the solution and is found on the bottom of the tank as the double cyanide of zinc. In Langbein's Electro-Plating, tables are given of the chemical and electro-chemical equivalents of metals and the weights decomposed by 1 ampere per hour in grammes. Copper 1.1925 grammes and zinc 2.2125 grammes. It seems to be the opinion of most platers that the proportion of copper to zinc should be 2 or 3 to 1 of zinc. Langbein also states that since brass contains more copper than zinc, more of the former will be withdrawn from the bath. Now in order to get a good brass deposit we would have to deposit more copper than zinc; that is, if we wish to keep the proportions of 2 or 3 to 1. According to the table, copper is 1.1925 and zinc 2.2125 grammes; therefore we would have to deposit copper at the rate of four times to that of zinc. Now as we are using the same current for both metals, whether the anodes are of brass or copper and zinc, we are getting more zinc than the copper can take up. As the copper is withdrawn faster than the zinc, it follows that there is always an excess of zinc being formed. In using the two metals, copper and zinc, as in a brass bath having different rates of deposit, it is a hard matter to control the current so as to get a good yellow deposit of brass. Of course we get a brass, but not in the right proportions; therefore we have to add additional agents, such as carbonate of ammonium, carbonate of soda, bisulphate of soda, liquid ammonia, etc., to bring up the zinc so as to get a good yellow color. What chemical action takes place when we add those salts to a brass solution, I can't say, but we have to add them, if we wish to get a good color. Now as copper is withdrawn faster than the zinc which is in excess, we also have to add the copper salts. As these additional agents are added to the solution from time to time, the solution becomes overloaded with carbonates and zinc and has to be diluted with water or thrown away, when the same thing is gone all over again. It seems to me that these additional agents are added to reduce the zinc so as to get it in the proper proportion to form a good yellow brass, or the excess of zinc forms the double cyanide of zinc with the cyanide for the brass solution and so falls to the bottom of the tank. I may not be correct; perhaps some of the chemists of the A. E. S. can tell us what chemical action takes place. In a bulletin issued by

Munning-Loeb Co., tables are given of rates of deposit and amperes required to plate one square foot of surface. Copper and zinc are given as follows: Copper, 6 to 8 amperes per square feet; Copper, 18.16 grains per ampere per hour; zinc, 18.72 grains per Copper, 18.1* grains per ampere per hour; zinc, 18.72 grains per ampere per hour, on 1/10 square foot of surface.

If we wish to deposit brass in the ratio of 2 or 3 to 1 we would have to deposit two or three times more of copper than of zinc, as it takes 6 to 8 amperes to deposit copper on one square foot and only 1½ amperes to deposit zinc. If we use a current of more than that required for brass plating we get a zinc deposit. In an ordinary brass solution there is a certain limit as to how high a current we can use. It is well known if we go over a certain point, instead of getting an increased brass deposit we get a zinc deposit. Now it takes 6 to 8 amperes for copper and 1½ amperes for zinc for one square foot. If we increase the current to 6 to 8 amperes we get a zinc deposit, because it only takes 1½ amperes to cover nearly seven feet of surface. This is the reason, I think, why we get a zinc deposit by using a high current. Now, according to the ratio of deposit of copper and zinc, if we wish to deposit brass in the proportion of 2 or 3 of copper to 1 of zinc, or maybe more, we would have to deposit more copper than zinc, and, as we can't very well do this without depositing the zinc also; for 1 ampere deposits 1.1925 grammes copper and 2.2125 grammes of zinc. I thought if we could have two anode rods, one for copper and the other for zinc, each rod connected to different rheostats, and separate ammeters so that we can read the number of amperes flowing through each anode rod; make up a regular copper solution, get it in good working order and add just enough cyanide of zinc to get a good color, or we could dissolve enough zinc from the zinc anodes to get the same thing. In making the solution in this way it would be like running a brass solution with copper anodes only instead of adding zinc cyanide from time to time we would be simply taking the zinc from the anodes. Now I don't know if we would get a zinc deposit from using a higher current to deposit the copper in the ratio of 2 or 3 to 1, as there would be more copper in the solution than zinc. For example, if we wish to deposit copper and zinc in the proper proportion to form a good yellow brass, we find that one ampere deposits 1.1925 grammes of copper and 2.2125 grammes of zinc. Now if we wish to get these proportions in the proper ratio we would have to deposit four times as much copper than zinc—1.1925×4=4.7700 grammes; and if we leave the current remain on the zinc rod so as to get 2.2125 grammes of zinc we would be getting the copper and zinc practically in the ratio of 2 to 1. In an ordinary brass bath there is a certain limit as to how high a current we can use; if we go over that point, instead of getting an increased deposit of brass, we get one of zinc.

Now, I don't know if this arrangement will work or not, and it may not be practical, as I haven't tried it, as it's just merely an idea; so let me know what you think of it. Trusting to hear from you, etc.

ANSWERING MR. DUFFY'S QUESTIONS CONCERNING BRASS PLATING.

By Joseph Birbaum, Milwaukee Branch.

Brass plating, the perplexing problem, the electro-plater's universal stepchild whose good qualities seem to be the least understood and therefore receives the most dislike and at the same time the most attention, has brought forth an interesting question and idea from one of our members.

These questions, upon request of Mr. H. J. Richards, editor of the Monthly Review, I shall herein try to answer as concentrated and plain as possible. As they are rather extensive they should proceed the answer as a separate paper, but in short we can sum up the crux of it in the following:

Is it practical to equip a brass bath with separate positive poles, one for zinc, the other for copper anodes, each positive rod connected with a separate rheostat for individual current control, to serve as a preventive for excess of zinc in the bath as well as means for increased output or production?

Well, let's see:

First, we must take into consideration that when two metal salts are dissolved in the same electrolyte, no transposition or combining of the metals of these salts takes place; cyan copper will remain cyan copper, cyan zinc will remain cyan zinc; the only chemical change upon addition of sufficient KCN being the formation of double cyanide of copper ($KCuCN_2$ and double cyanide of zinc ($KGnCm_2$).

Although the anodes consist of brass and brass is deposited as such at the cathode, the molecular particles in solution contain copper and zinc; the anodes are attached by the kathions, consisting in this instance of KSN. These kathions are again becoming charged with metal and positive electricity and are again migrating as anions to the cathode to free themselves there of their charge, and thus the quantity of metal so transmitted takes place according to their *valences, atomic weight, quantity of electricity* and *quantity of ions present.*

Our next step will be to look up the metals to be deposited. Here we find:

Copper: Valence, 2; atomic weight, 63.12.

Zinc: Valence, 2; atomic weight, 64.91.

We see herein that copper and zinc are vivalent elements and that their atomic weight is nearly equal.

Now if metals, respectively the metal or positive ions, are transmitted and deposited in quantities relative and corresponding to the valency and atomic weight of the metal to be so transmitted in an electrolyte from the anode to the cathode, then nearly equal amounts of copper and zinc ions will be migrating under an equal current, providing the electrolyte and the positive electrode consist of about 50.1 parts of copper and 49.9 parts of zinc.

An alloy and an electrolyte of these proportions is not and therefore cannot in practical and efficient way furnish a good yel-

given of rates of deposits and amperage required to plate one square foot of surface, copper and zinc are given as follows:

Copper, 6 to 8 amperes per square foot; zinc, 1½ amperes per square foot; and the rate of deposit is: Copper, 18.16 grains per ampere per hour; zinc, 18.72 grains per ampere per hour, on 1/10 square feet of surface.

If we wish to deposit brass in the ratio of 2 or 3 to 1, we would have to deposit 2 or 3 times more copper than zinc, as it takes 6 to 8 amperes to deposit copper on one square foot and only 1½ amperes to deposit zinc, etc.

This table is undoubtedly referring to separate plating solutions, copper and galvanizing, 6-8 amperes being given as the correct current quantity for a copper deposit in a copper bath and 1½ amperes as the proper current for a zinc deposit in a galvanizing bath, and I came to the conclusion that the questioner became confused by combining two distinctly different subjects—*the amperage required for copper plating and electro-galvanizing and the weight deposit per ampere hour.*

He should not have referred to the first table at all, as in that case, if it should have any bearing on brass plating, it would be absolutely impossible to manage a brass bath under 6-8 amperage, or, for that matter, any amperage, as under the present proportion (2-1) again as much zinc than copper would be deposited and the bath would soon be robbed of its entire zinc content and only the low brass as it must consist of (65-35), hence it becomes plausible that the bath must contain as well as the anode must liberate at least again as many copper than zinc ions if we desire a rich yellow deposit.

That metals are deposited absolutely in conformity with their valency and atomic weight we shall prove by questioner's own tables. Although the way in which he set this table, or perhaps an extract of it, down is at first glance confusing, giving the appearance of a four times greater velocity of the migrating zinc ions.

Says he: In a bulletin issued by Munning-Loeb Co., tables are zinc of the brass in the electrode, alloyed with 2 parts of copper, or the zinc of the zinc anode (as suggested) would remain to replenish the electrolyte with zinc, and where first a white deposit will be received, with the diminishing of zinc ions, the deposit would soon pass to bronze and light copper tones.

That 6-8 amperes are used in a copper bath to deposit copper and 1½ amperes to deposit zinc in a galvanizing bath, has nothing in common, nor should it be mentioned in conjunction with a brass electrolyte wherein not less than 8 amperes per square foot are employed, even though both metals are used to in proper proportion alloy and electro-chemically deposit a third metal, "brass." This amperage is nothing more than the proper current density for a smooth, non-porous and good-adhering deposit in their respective baths. But what is of mighty importance and should have been taken in consideration only is this: that, according to the table cited, one ampere hour deposits

18.16 grains of copper per 1/10 sq. ft. or 181.6 per sq. ft.
18.72 grains of zinc per 1/10 sq. ft. or 187.2 per sq. ft.
Or 0.560 more of zinc than copper per sq. ft. amp. hr.

In a brass bath we are depositing at an equal ratio of the metal or positive ions and again the amount of copper ions being present in the electrolyte as well as two parts of copper in the electrode, and assuming 8 amperes are applied per square foot, we are therefore depositing 16×181.6=2905.6 parts of copper per square foot; 8×187.2=1497.6 parts of zinc per square foot in one hour—very close to the required 2 to 1 proportion.

It becomes therefore obvious that the idea of separate anode rods with separate rheostats and varying current densities for the zinc and copper anodes, as suggested, is not necessary, nor is it practical, but rather detrimental, for the following reason:

If a higher current is directed into the positive rod supporting the copper anodes, the work exposed towards this side would receive a considerable heavier deposit than the sides exposed to the positive rod supporting the zinc anodes into which a much weaker current is led, or vice versa; and inasmuch as a denser current of electricity transmits more ions, not only would the deposit be of uneven thickness, but also the color would be of varying shades, so, instead of overcoming this trouble matters would be aggravated still more.

Regarding the deposit ratio of copper and zinc per ampere in grammes, copper is tabulated by the "Questioner" as depositing 1.1925 grammes and zinc as 2.2125 grammes per ampere hour, an error must have crept into this tabulation. Copper is deposited at a rate of 1.1858 grammes and zinc at 1.2200 grammes per ampere hour, or as previously stated absolutely in conformity with the valence and atomic weight of the respective metals.

Now, since this seems to be the root of the misconception formed, I am again compelled to repeat, if the zinc ions would release their metal at a rate of 2.215 grammes per ampere hour, or, according to his tabulation, nearly again as fast as the copper ions and our present successful brass bath as well as anodes consist of 2 parts of copper to 1 of zinc, it would not be possible to maintain a 2-1 brass bath for any length of time, nor to receive the correct proportion of a 2-1 brass.

Fortunately, this is not the case. The reduction of metallic zinc at the cathode being 1.2200 grammes per ampere hour or only 0.0142 grammes more than copper, and as we have two copper atoms present to one of zinc, it follows, therefore, that zinc will deposit at a rate of 33.35 to 66.66 parts of copper; in other words, a good yellow brass will be reduced, we might even say that theoretically not an increase, but contrary a decrease of zinc content in the electrolyte will take place, since we are drawing 0.0142 grammes more from it per ampere hour than our intent and original proportion of our sources, hence there is no possibility of excess of zinc forming in the bath in this manner.

If Langheim says more copper is withdrawn than zinc, this is, of course, absolutely correct, for the simple reason that 2 parts of

copper are present and must be deposited for a correct proportioned brass; but this is no reason for excess of zinc forming in a good working bath, when addition of metal salts are necessitated by a decrease of metal in the bath this fact should be borne in mind, and if the deposit be correct in color, addition of metal salts must be made corresponding to the original proportions.

That such addition must be made, but should be proceeded by an analysis we shall see presently.

Test and close observations have convinced me that a 100 per cent anode efficiency is not possible in a hard working brass bath. Recent tests in which we kept a brass bath under special observation proved an anode efficiency varying between 88-91 per cent. during this time, which covered a period of three months, the bath produced excellent results in quality as well as quantity of the output. We therefore can rightfully assume that any anode efficiency of 90 per cent in regular commercial production is ideal and the highest obtainable average, whereas with copper, silver and gold, under proper care, fully 100 per cent can be attained.

A 10 per cent anode deficiency leaves us of course with a 10 per cent deficiency of metal in the bath and there exists no doubt in my mind that incorrect rectifications of these metal deficiencies and overdone additions of socalled constructors and brighteners are at fault of putting brass plating at par with a disagreeable job at fault also for excess of one or the other of the metals in the electrolyt.

We can then constitute this as reason for excess of zinc in the bath, for reason two we must look up our anodes drawing 90 per cent of our metal from the anode will readily convince even a novice in electro deposition of the importance of this source of nourishment. Strange ot say this source seems to be slighted and overlooked the most. An experiment in this direction has come to my attention wherever anodes were made from the skeletons of brass stampings the surprising fact appeared in a 96 to 98 anode efficiency. This no doubt occurred on account of the numerous preforations in these sheets, thereby giving the Kathions hundreds of points to attack, but a second factor also manifested itself, gradually the deposit turned a greenish yellow, thereby indicating an excess of zinc. After due consideration of all possible causes the hrdlus anodes were finally analyzed and found to be a very light and poor brand, containing nearly 11 per cent more zinc than wanted, hence care should be exercised in buying anodes, the best is none too good.

The third reason, over excess of K. C. N. If too great an excess of K. C. N. is present a large percentage of the metal ions is consumed before they reach the cathode or are attached there two parts of copper to one part of zinc being present no zinc and only a fraction of the copper may be successful in depositing, and the result in this case, if any, usually is a very thin copper deposit.

The fourth reason, although diametrically opposed to the third, may result in the same action. This fourth reason is extreme deficiency of K. C. N. and is causing a coating over of the anodes and consequently a reduction of migrating ions with a final result equal to reason three.

These two latter named reasons can therefore become a cause for excess of zinc when the bath is again in good working order, since through such mismanagement of the solution a larger percentage of copper was drawn out. If now such conditions are repeated often by an inexperienced or careless worker, the time may arrive where a troublesome excess of zinc makes its appearance, hence we come to the conclusion that only through mismanagement and misuse of the electrolyte is the electric current a direct cause for excess of zinc forming therein.

Once more will we take up excess of zinc in the bath. The questioner attributes the following statements to Mr. Hogaboom. When the zinc content in a brass solution reaches a certain point it precipitates itself from the solution and is found at the botom of the tank as the double cyanide of zinc.

I don't know what article of Mr. Hogaboom's he is referring to, and neither do I believe that Mr. Hogaboom ever made a statement of this kind, as he is too far advanced in the electro deposition of metals. As a matter of fact, zinc will crystalize in a highly concentrated bronze solution when exposed to extreme cold, similar to double nickel salt in a highly concentrated nickel bath when below correct temperature. This zinc crystals are forming like thousands and thousands of needles and appear mostly on top of the solution, and as they consist of double cyanide of zinc, they are not found precipitated as such at the bottom of the tank, as they are readily soluble in water. A warming up of the solution will quickly bring these zinc crystals back to liquid form.

The zinc found on the bottom of the tank is not double cyanide of zinc, but rather a precipitate of zinc loosened from the scum of the anodes; also, it may be single cyanide of zinc, or free carbonates not held in solution on account of deficiency of cyanide. Crystalization may also be caused by supersaturation of the solution. Why zinc only will crystalize and not the copper, although more of the latter is present, is still an unsolved problem.

Brass solutions being alkaline no chemical action takes place when adding carbonates. In an old bath additions of such have no value, but rather contrary, will hinder rapid transmission of the metals. Carbonates of Sod. of Potash are forming by the decomposition of cyanides and the modern platers are searching for means to overcome this and is not adding more of these carbonates.

Generally formulas for brass baths prescribe an addition of carbonates of soda, which is correct for a new prepared solution, as it will age it. After the bath gives good, uniform results, such addition should not be made any more, since, as said above, more are formed by decomposition than are needed.

In general, these carbonates are the cause of dull, earthy and bronw deposits; therefor the first principles to follow, if bright deposits are wanted, is to eliminate them as much as permissible.

Ammonia also forms no chemical reaction beyond oxidizing the metals, thereby causing a slower deposit. Both ammonia and Sod. Carb. tend to keep the anodes cleaner and where one gives a dull deposit the other allows a lighter one.

As to bisulphate of soda, if by addition of sulphates caprous

copper is formed, which is cmfwyp, it seems to me that upon forming K. C. or C. N., an equivalent element is again received. However, this is a question of high importance and deserves the attentions and settlement cmfwyp thought by some of our foremost chemists, as copper from

Cuprous Sol. is deposited at a rate of 2.3717 grams per amp. hr.

Cupric Sol. is deposited at a rate of 1.1858 grams per amp. hr.

Sod. Bisulphate also acts as a reducer of the carbonate and a brightener of the deposit.

At present we are carrying on an experiment with the double cyanides of metal in solutions only. No other ingredients, as far as control of an even color is concerned, and ease of control of metal proportions I can report excellent results. Much is to be taken in consideration though, but according to all results gotten so far we can say that a simple electrolyte composed of double cyanides is gratifying practical, however a full report will be forthcoming when these experiments are completed.

In reading this answer over I find much more could have been said, but my aim was to hold myself to the question only. Nevertheless, I trust it will dispel the misconception formed by the questioner and be of interesting value to the A. E. S.

For the Review and the Society I thank both Mr. Duffy for this question, and Mr. Birbaum for the answer. Questions on topics of value will always be welcomed and in due time appropriately answered.—Ed.

JOTTINGS FROM COONTOWN.

FROM THE SUNNY SOUTH

By W. S. Barrows.

Since boyhood days I have always entertained a kindly feeling for the untutored but courteous negro. During my Florida rambles I have met many an interesting "mammy" and witnessed several very comical incidents among the colored people.

I have been unable to locate a branch of the Lime Kiln Club, but attended the various churches conducted by colored people. The announcements given out at one service struck me as being particularly worthy of further consideration. They were as follows:

"Directly after dis sermon dar will be a baptism of one adult and two adulteresses.

"Monday.—De Ladies' Belovement Society will serve supper from 5 to 7. All sisters giving milk will please come early.

"Wednesday.—De Ladies' Literary and Musical Club will meet dis ebening, when Sister Johnson will sing 'Put Me in My Little Bed'—accompanied by the pastor.

"Thursday.—Dar will be a meeting of 'Little Mothers' at 7:30. All sisters wishing to become little mothers will meet the pastor in his study before 7 o'clock.

"Dis afternoon at 2 o'clock a mission meeting will be held in de North End; at 3 o'clock in the South End. Children will be baptized at both ends.

"Dis service will be closed by singing 'Little Drops of Water.' Some Sister will please start 'Little Drops of Water' and de rest of de congregation jine in."

ELECTRO GALVANIZING.

By C. Vance, Member Cincinnati Branch A. E. S.

About twelve years ago the firm by whom I was employed began the manufacture of a washing machine. After considerable discussion it was decided that a coating of zinc was the best preventative of rust on the metal parts.

Hot galvanizing could not be used because the parts had to be machined and if hot galvanized, they would have to be retapped which would have exposed parts which would become rusted; so it was decided to cold galvanize them.

We at the time had in operation a plating plant doing gold, silver, nickel, brass and copper plating, but I had no experience in zinc plating.

The work to be plated was gray iron castings. I first made a solution composed of zinc chloride and used ammonium chloride as a conducting salt, using cast zinc anodes. The deposit was smooth and very white and threw well in the deep part of the castings.

The one great trouble that I had was that the anodes would become coated over with a thick white scale which was very hard to scrub off, and would retard the current unless scrubbed often; also the anodes would not dissolve evenly, but would become uneven and full of holes, caused by the solution not acting uniformly because of the scale. I used this solution for about two years and then discarded it and made up a solution composed of zinc sulphate, using ammonium sulphate as the conducting salt; this overcame the difficulty with the anodes, but that deposit was inclined to true out from the wash in the solution if the current was too strong; also the deposit burned on the edges and parts nearest the anodes. I overcame this by adding aluminum sulphate and glycerine to the solution.

I did not know then, or do I know now just what chemical action took place in the solution, or why it to a great extent, done away with the truing out and burned deposit. I have read and heard several different explanations covering these points, but they did not make it clear to me.

Later on I began using ammonium chloride as a conducting salt in place of the ammonium sulphate, and seemed to get still better results. The solution was now working fine, the deposit was good and the anodes dissolved away evenly, so that the waste in scrap was small.

I had a jar of dilute sulphuric acid in which I dissolved the zinc would dissolve; this solution was then filtered and kept as a scraps of anodes until the acid was entirely exhausted and no more zinc would dissolve, this solution was then filtered and kept as a stock solution to replenish the metal in the plating solution when needed.

The first racks I made were of copper wire with soldered joints, but the acid soon began to dissolve the solder, so that they were in need of constant repair.

I next made new racks, using a square copper bar for the upright bar and flat brass for the cross bars, riveted to the upright

with copper rivets. I next drilled holes in the cross bars and made hooks for the work of spring brass which I put through the holes and bent so that they would not come out; so my trouble with racks was at an end. The castings were pickled in diluted mixture of hydrofluoric and muriatic acid in a lead-lined tank, using baskets made of perforated brass and copper, riveted.

After work was pickled, it was put in cold water, racked up and put directly in the plating solution. I used muriatic acid in the pickle because sometimes the castings were slightly rusty when they reached the plating room.

My next difficulty arose when the firm began the use of cold rolled steel stampings in place of the castings; then I had trouble. The stampings came in to the plating room direct from the presses with plenty of oil on them. I tried cleaning them in many ways, but the deposit would be patchy and rough. I finally got results by dipping them in a strong nitric acid dip. The trouble here was that the fumes from the acid dip were not very agreeable to breathe all day long. I installed an electric cleaner; this was a labor-saver, but did not do away with the nitric acid dip. I finally got rid of it entirely by using a strike solution made of zinc carbonate, potassium cyanide and sodium carbonate, using zinc anodes.

At first we freed the stampings of oil with benzine, but later changed to mineral cleaner used at boiling point and tumbled the work in this for about ten to fifteen minutes, then put them in cold water, racked them up and run through the electric cleaner, rinsed in water, dipped in muriatic acid, rinsed in water and run in strike solution for about five minutes, in which time they would be evenly coated over with zinc which threw well in the deep places. The work was then rinsed in running water and hung in regular plating solution for about thirty to forty-five minutes, which gave them a good, heavy deposit.

THE PRODUCTION OF THE VERDE GREEN FINISH.

By W. Wicks, Cleveland Branch.

On copper, brass bronze or oxidized copper, this finish is termed the acid verde. The solution which I use consists of 2½ lbs. blue vitriol, 1¾ lbs. sal ammoniac, ¾ pint acetic acid, 1¾ pint vinegar, 2 lbs. rock salt, in 5 gallons of water.

If you desire the black ground, copper plate and oxidize your work the same as oxidized copper, dry with hot water and allow your work to cool. Then dip in your verde solution for one-half minute. Then hang up until your verde green forms, which will be a short time, according to the atmosphere. You now dampen a painter's sash tool with the same solution and proceed to striple your work. The beautiful effect will depend on the stripling, which will be learned with very little practice. Do not wait until your verde is too dry before stripling, also do not striple until your green is well formed. After the stripling leave, hang until dry, then lacquer with a clear lacquer and, when dry, wax, which will give a beautiful soft effect.

If you desire a brown background, produce on copper; if a lighter effect, produce on brass. But under all consideration, if you desire the black background, copper oxidize your work.

WHAT THE BRANCHES ARE DOING

NOTICE.

My attention has been called to the fact that some of the Branches are electing one delegate to the convention. Under our constitution every Branch is entitled to three delegates.

H. H. WILLIAMS,
First Vice-Pres.

CLEVELAND BRANCH.

Meets once a month at American House. Secretary, Charles Werft, 1775 East Sixty-eighth Street, Cleveland.

At our meeting May 27th Mr. H. J. Geo. Doest was elected president; Wm. Micks, vice-president; Chas. O. Werft, secretary and treasurer; James Purcell, librarian; Geo. Randall, E. W. Hale, F. Burkhart, board of managers for Cleveland Branch.

H. J. Tes Doest, Chas. O. Werft, W. D. Scott, delegates. W. Wicks, T. Heckle, E. W. Hale, alternates to the convention. The convention committee reported that everything was well in hand.

TOLEDO BRANCH.

Meets the last Tuesday of each month at Toledo University. Secretary, James E. Nagle, 209 Navarre Ave., Toledo, Ohio.

Meeting of May 26th.

As this was the last meeting of the fiscal year the following officers were elected for next term:

President—H. L. Myers.
Vice-President—H. Schuldt.
Secretary—Jas. E. Nagle.
Treasurer—E. J. St. Amand.
Librarian—H. Wandtke.
Board of Managers—Wm. Whitcker, O. Cope and T. L. Pierce.

Jas. E. Nagle wa selected delegate to represent the branch at the coming convention, with Wm. Whitaker as alternate.

As our class in chemistry have practically completed their course we have decided to hold a regular meeting on the second and fourth Tuesdays of each month, and we are to have the use of the laboratory at the Toledo University on these nights if we wish to carry out any experiments. We have an ideal meeting place, with practically everything our society could want, and yet there are a good many platers in this town who cannot see any advantage in belonging to the society.

INDIANAPOLIS BRANCH.

Meets second Saturday of each month at Hotel Dennison. Secretary, Louis Mertz, 1725 Union Street, Indianapolis, Ind.

President Aufderheide presided over our May meeting; the attendance was fair.

The annual election of officers was held and the following officers elected:

President—B. D. Aufderheide.
Vice-President—Geo. Barrows.
Secretary-Treasurer—Louis Mertz.
Board of Managers—Geo. Becktel, R. Hennessey and Gus Loeckle.
Librarian—Wm. Cartheuser.
Delegates to Convention—B. Aufderheide, Geo. Barrows.
Decided that we hold special meeting Sunday, May 21st, to make arrangements for exhibit to be sent to the convention.

DETROIT BRANCH.

Meets first Tuesday of each month at 26 East Congress Street. Secretary, B. E. Miller, 543 Townsend Avenue, Detroit, Mich.

The regular monthly meeting was held June 6th, with an attendance of twenty. H. S. Brockway and Chas. Cequin were elected as delegates to the convention. For alternate, E. G. Sovering and E. W. Woodmansee were elected. Moved and supported that our delegates be instructed to make an effort to have the convention held in Detroit in 1917, which was carried.

The incoming officers were installed in their respective stations by our past president, E. A. Wetmore. Each officer was called upon for a few remarks, which caused some sport.

In behalf of the retiring officers it was moved and supported that a vote of thanks be extended to them for their most excellent services, which was carried.

It is anticipated that there will be a large attendance at the convention from the Detroit Branch.

PHILADELPHIA BRANCH.

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets Secretary, Philip Uhl, 2432 North 29th Street, Philadelphia.

The regular monthly meeting of Philadelphia Branch was held Friday, June 2nd, with a good attendance. The new officers were installed in their respective places. Harry Seaser was elected as delegate to the convention in place of Philip Uhl, who found it impossible to attend.

CHICAGO BRANCH.

Meets fourth Saturday of each month, 8 p. m., Western Building, Randolph Street and Michigan Avenue. Secretary, Oscar E. Servis, 3020 George Street, Chicago, Ill.

The regular monthly meeting was held April 22nd, with Oscar E. Servis presiding.

A committee was appointed to draft resolutions of condolence and sympathy with Albert Frank, a member of Chicago Branch, whose wife recently died.

Comments were made and discussions held on various papers published in the April Review.

The lease of our present meeting place was renewed for another year.

The regular monthly meeting was held May 27th, with O. E. Servis presiding. After the regular routine business of the meeting was concluded, the annual election of officers took place and resulted as follows:

President—J. F. Manz.
Vice-President—H. A. Gilbertson.
Secretary-Treasurer—O. E. Servis.
Librarian—George Burt.
Board of Managers—J. H. Hall, H. H. Posbeck, J. H. Hensjosten.

The following were elected delegates to the national convention, to be held at Cleveland, Ohio, July 6, 7, 8: O. E. Servis, J. F. Manz, J. H. Hansjosten. Alternates: J. H. Hall, H. H. Posbeck, A. H. Wicks.

TORONTO BRANCH.

Meets fourth Tuesday of each month at Occident Hall, Bathurst and Queen Streets. Secretary, Ernest Coles, P. O. Box 5, Coleman P. O., Toronto, Ont.

The regular meeting of the Toronto Branch was held on Thursday, May 25th, with President Salmon presiding over an excellent attendance. The election of officers for the year 1916-17 took place and resulted as follows:

President—W. J. Salmon.
Vice-President—John Acheson.
Secretary-Treasurer—E. Coles.
Librarian—John A. Magill.
Trustees—W. W. Wells, Jr., T. Chas. Orr and James Vallier.
Sergeant-at-arms—John Young.

With one exception, James Vallier, this being the same line-up as the previous year.

Under good and welfare, a very interesting talk was held on plating problems in general. Loss or current in iron plating tanks, deposition on the sides of brighteners, zinc plating, etc. These subjects were all handled and discussed with a vim that marked the closing of a very succesful year for Toronto Branch. Satisfaction with the past year was very evident and the wish expressed that the coming year will eclipse the past.

A special meeting was held on Tuesday, June 6th, and Mr. Wm. G. Salmon, delegate, and Mr. Wilfred Thompson and John Acheson, as alternates, were elected to represent the branch at the Cleveland convention.

ROCHESTER.

Meets second and fourth Friday of each month at University of Rochester. Secretary, C. V. Haring, 603 Dewey Avenue, Ro- Secretary, F. H. Nordmann, 720 Froom Ave., Cincinnati, Ohio.

ST. LOUIS BRANCH.

Meets third Saturday of each month at Public Library Assembly Rooms. Secretary, F. C. Rushton, 4405 Blair Avenue, St. Louis, Mo.

The regular monthly meeting of the St. Louis Branch A. P. S. was held May 20th.

The following were elected to office for the ensuing year:

H. H. Williams, President.

H. J. Richards, Vice-President.

F. C. Rushton, Sec-Treas.

E. J. Musick, Librarian.

Geo. Samkemeyer, H. Duebelbeis, J. T. McCarthy, Board of Managers.

The following were elected as delegates to the Cleveland convention: H. H. Williams, H. J. Richards, F. C. Rushton. Alternates: E. J. Musick, J. T. McCarthy, Louis Gans.

At the conclusion of the business session W. R. Abbott, member of Chicago Branch, gave a short talk, and Mr. Richards began a paper on Simultaneous Copper Plating and Cleaning, which will be continued at the next meeting.

A vote taken on the best paper read at the Dayton convention resulted in a unanimous vote for Edwin W. Heil, of Wichita, Kansas. Not because he is a member of the St. Louis Branch, but because his paper was considered a very practical and valuable paper on nickel plating, in which a large number of our members are interested.

It was voted to again exhibit at annual convention the nickel plated legs, without refinishing, as all of these stove legs were plated with different formulas and voltages, the members deciding it would benefit and interest members of other branches to see the result of the different formulas after one years' time.

PROVIDENCE BRANCH.

Meets second and fourth Wednesday of each month at No. 60 Weybosset Street. Secretary, Albert J. Lemrise, 124 Waverly Street, Providence, R. I.

The Providence Branch met as usual Wednesday, May 10. After the roll call, minutes for the previous meeting were read and accepted. Communications from the Supreme Secretary, the Editor, Mr. C. H. Proctor and Mr. D. J. Tes Doest were read to the members. It was decided not to be represented at the convention this year. The business of the branch being over, two new members, Mr. G. J. Tyndall and Mr. Elmer K. Juergan were initiated.

The president and treasurer addressed the new members, who replied with well chosen remarks. Mr. G. J. Tyndall was appointed to communicate with the Manufacturing Jewelers' representative in order to get an announcement in their columns.

Different subjects relating to electro plating were discussed, consisting of matt dipping, aluminum and white gold solutions.

Secretary was requested to communicate with the Editor for information on that subject.

The librarian read a paper, by the secretary, on "The Advantage of a Voltmeter in the Plating Room."

The meeting then adjourned to May 24th.

The second regular meeting was opened by the president. After the roll call, minutes for the previous meeting were read and accpted. Commucinations from the Supreme Secretary, Mr. Richards, and Mr. Proctor, were read to the members. The question of dues for the new year was next discussed. The branch decided to pay the same quarterly, at the rate of $6.00 per annum. Although this amount is small, they hope to gain enough new members to more than meet the current expenses. The same officers were re-elected for the coming year and a new member, Mr. William Park, Jr., was initiated.

The librarian read notes on silver, nickel and tin deposits, and the members discussed divers plating subjects. The meeting then adjourned to June 14.

If you have any material on the deposition of white gold kindly favor us with same.

NEW YORK BRANCH.

Street, New York City, 8 p. m. Secretary, Wm. Fischer, 300 St. Anns Street, New York City.

DAYTON BRANCH.

Meets first Wednesday of each month at the Y. M. C. A., Dayton, Ohio, Secretary, Alphonz Lamourcux, 500 East First Street, Dayton, Ohio.

BRIDGEPORT.

Meets third Friday of each month at the office of the Brass World, 260 John Street, Bridgeport, Conn. Secretary, Nelson Barnard, 858 Howard Ave., Bridgeport, Conn.

MILWAUKEE BRANCH.

Meets first Friday of each month at West Side Bank Building, Third and Chestnut Streets. Secretary, E. C. Yaeger, 962 Ninth Street, Milwaukee, Wis.

NEWARK BRANCH.

Meets first and third Friday of each month, 8 p. m., 47 Bank Street, Newark, N. J. Secretary, Geo. Reuter, Jr., 333 S. 19th

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CINCINNATI.

Meets once each month at Dennison Hotel, Cincinnati, Ohio. Secretary, F. H. Nordmann, 720 Froom Ave., Cincinnati, Ohio.

BUFFALO.

Meets first Saturday of each month at the University of Buffalo, 8 p. m. Secretary, John G. Murphy, 71 Dingens St., Buffalo, N. Y. Street, Newark, N. J.

APPLICATIONS FOR MEMBERSHIP.

CLEVELAND BRANCH.

Mr. Bert McLain.....Care Cleveland Foundry
Mr. Fred L. Greenwald.....16015 Parkgrove Ave., Cleveland, O.

CHICAGO BRANCH.

Mr. John C. Tobinski.....3222 N. Lawndale Ave., Chicago, Ill.

TORONTO BRANCH.

Mr. John A. Bloxal.....1072 St. Urbain St., Montreal
Mr. Arthur L. Chittern.....1112 Dovercount Rd., Toronto, Ont.
Mr. John Henry Collins.....175 Geoffrey St., Toronto, Ont.

PROVIDENCE BRANCH.

Mr. Robert H. Moore.....43 Pennsylvania Ave., Providence, R. I.

PHILADELPHIA BRANCH.

Mr. F. O'Neal.....1922 N. Somerset St., Philadelphia, Pa.
Mr. B. C. Willis.....72nd St. and Powers Lane, Philadelphia, Pa.
Mr. A. K. D. Kedgraves.....72nd St. and Powers Lans, Philadelphia

NEW YORK BRANCH.

Mr. F. C. Mesle, Box 177.....Sherrell N. Y.

ELECTED TO MEMBERSHIP.

CHICAGO BRANCH.

Mr. John T. Satka.....1602 S. Wood St., Chicago, Ill.

INDIANAPOLIS BRANCH.

Mr. Frank E. Thompson.....431 Prospect St., Indianapolis, Ind.

CLEVELAND BRANCH.

Mr. A. K. Schultz.....1649 East 28th St., Cleveland, O.

ROCHESTER BRANCH.

Mr. Chas. Feltz.....463 South Ave.

NEWARK BRANCH.

Mr. Herman Biehlman.....903 Garden St., Hoboken, N. J.
Mr. Herbert B. Church.....care Consolidated Pin Co., Bloomfield, N. J.
Mr. Geo. Seward.....278 S. Sixth St., Newark, N. J.

DETROIT BRANCH.

Mr. Walter Sternpin.....1432 Central Ave.
Mr. A. S. Burrows.....382 Hulbert Ave.
Mr. A. D. Cowperthwait.....care The Edmond Jones Co.

NEW YORK BRANCH.

Mr. John Loeffler.....310 Smith St., W. Hoboken, N. Y.
Mr. Jos. Oswald.....392 E. 158th St., New York, N. Y.
Mr. H. Maynard.....354 21st St., Brooklyn, N. Y.

Change of address: Mr. Joseph Wooldridge, 1242 Bloor St. West. Toronto. Ont.: Mr. Thos. G. O'Keefe, 23 Roxborough St., West, Toronto, Ont.; Mr. Philip J. Cooper, 167 Concord Ave., Toronto, Ont.; Mr. Wm. Fischer, 300 St. Anns St., New York City.

Wanted —Another entrant for that swimming race. Ermie Lamourene prefererd.

...All Foremen Platers...

And others who are interested are invited to attend the

Fourth Annual Convention

— of the —

AMERICAN ELECTROPLATERS' SOCIETY

(An Educational Society)

At Cleveland, Ohio, July 6th, 7th and 8th, 1916

The meetings, open to all who are interested in electro-plating, will be held at Statler Hotel. Interesting papers will be read and discussed. Members are requested to attend, bring samples of their work, and join in the discussions.

Suitable arrangements have been made for the entertainment of visitors.

Manufacturers and supply houses are invited to display and demonstrate their newest plating and polishing supplies and equipment. Free space and facilities will be provided. Further particulars can be obtained from

WALTER FRAIN, Sec'y
American Electroplaters' Society
507 Grand Ave., Dayton, Ohio

CHAS. WERFT, Sec'y
Cleveland Banch
1775 E. 68th St., Cleveland

Programme

THURSDAY, JULY 6th

16.00 A. M. Registration. Welcoming all visitors. Receiving credentials from Delegates. Welcoming address by Mayor Davis of Cleveland.
2.00 P. M. Business Session.
8.00 P. M. Papers and Round Table discussions.

FRIDAY, JULY 7th

10.00 A. M. Business Session.
Afternoon recess for delegates and visitors to see city.
8. P. M. Papers and discussions.

SATURDAY, JULY 8th

9.00 A. M. Visiting various plants.
2.00 P. M. Automobile trip over city.
7.00 P. M. Banquet.